

What about vibration?

What causes vibration?

Vibration is caused by any force acting on a surface of a structure that causes it to move back and forth from its normal resting position. While some military noise seems to shake the ground, the vibration in citizen's homes is caused by airborne sound waves (impulse noise).

Studies have shown that ground-borne sound waves lessen faster than the airborne waves. For example, at distances greater than 2,000 feet from the source, the airborne waves from a detonation of 1,000 pounds of explosive dominate over ground-borne waves.

How can noise shake my home?

An airborne sound wave is a force that acts on the external surfaces of a home, causing it to vibrate. This vibration is transmitted through the structure of a home to shelves, dishes, and loose windows, which may cause annoyance and concern.

Will it damage my home?

It is very unlikely that vibration from normal military activities will result in structural damage to your home. Military installations set firing limits to prevent such damage from occurring. These limits are based on various studies that include data on the amount of vibration that would damage a house. According to these studies, sound levels reaching a home or other structure must be greater than 137 decibels to cause any damage. Even then, there is only a 1-in-10,000 chance that damage will occur—glass and plaster cracks being the most extreme.

Will repeated vibration weaken my home and cause damage in the future?

The strength of many materials can be reduced by repeated vibration. This reduction in strength is

known as fatigue. However, fatigue from noise is negligible because

- houses and other structures are overbuilt to compensate for weakening by fatigue;
- brittle materials, such as glass, show little reduction in strength due to fatigue;
- fatigue in flexible materials, including most metals and wood, show that approximately one million noise-producing events are required to reduce the strength of the material by 50% (if Army activities are the only source contributing to fatigue in your home, it will be insignificantly affected by current activities); and
- normal preventive maintenance on your home will correct the effects of fatigue.

What is causing the damage to my home?

Structures can crack for a variety of reasons which have nothing to do with noise and vibration.

- Humidity and temperature are major sources of cracking of interior surfaces. The range of inside and outside humidity and the ratio of inside to outside surface and air temperatures (cold versus hot) can shrink and expand wood framing in homes.
- Intensity, duration, and direction of wind.
- Uneven settling of building foundation.
- Room volume wall and ceiling area—The larger the surface area of a wall or ceiling (high walls and cathedral ceilings), the more likely it is to crack from expansions or shrinkage.

- Orientation and partial shading of walls from sunlight—Uneven heating causes uneven expansion of walls.
- Type of skin, frame, exterior materials, and interior finish.
- History of patching.
- Presence of water leaking into building structure from external sources or condensing on interior pipes.

What can be done to reduce vibration?

Vibration can be reduced by placing a soft material, such as felt, between the two hard surfaces (e.g., a shelf and a dish) and by tightening loose windows and doors

For more information about the Army's noise management program contact:

Operational Noise Program
U.S. Army Center for Health Promotion and Preventive Medicine
MCHB-TS-EON
Aberdeen Proving Ground, MD 21010-5403
410-436-3829
<http://chppm-www.apgea.army.mil/dehe/morenoise/>

For more information on the Navy's Noise Management Program contact:

Special Assistant for AICUZ and Encroachment
Commander Navy Installations
Naval Facilities Engineering Command
Washington Navy Yard, Washington DC 20374
202-685-9181

For more information on the Air Force's Noise Management Program contact:

AICUZ/Noise Program Manager
Bases and Units Branch
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For more information on the Marine Corp's Noise Management Program contact:

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